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THE ECO-SOCIO-ECONOMIC LEVEL OF DEVELOPMENT OF WORLD COUNTRIES – A COMPREHENSIVE ASSESSMENT PROPOSAL

Key words: environment, ecology, economy, development, indicators

ABSTRACT. The main purpose of the article was to assess the eco-socio-economic development of world countries. For this purpose, the Comprehensive Eco-Socio-Economic Development Index (CESEDI) was proposed and used. The proposed measure is based on a dozen or so indicators recognized and used in the literature for assessing countries in terms of their social, economic and environmental achievements. An attempt was made to include most of the elements necessary for the safe, healthy and happy life of citizens of the studied countries. The article presents world leaders, based on the CESEDI. Moreover, the individual components of the CESEDI and their level in the analyzed countries are presented. It was found, inter alia, that 18 out of 20 countries with the highest CESEDI are European countries. The ranking leaders were highly developed Scandinavian countries (Norway, Denmark, Finland) and Switzerland. The countries of Eastern and South-Eastern Europe (Slovenia, Slovakia, the Czech Republic, Poland and Romania) took high positions in the ranking, ahead of such countries as Canada, the United Kingdom, Japan and the United States. Research results indicate that European and South American countries are, on average, more developed in terms of ecological, social and economic development than countries in the rest of the world.

INTRODUCTION

Development is seen, by some, as a historical process and, by others, as a planned move towards goals. Whatever view is adopted, it is essential to measure the progress that is being made. Interdisciplinary approaches should be used in measuring as well as planning and policy processes. This is due to the close link between economic development and cultural, social, environmental and political factors. Development processes throughout history have been extremely multidimensional [Takamori, Yamashita 1973].

The role of economic factors among the most important variables explaining socio-economic development cannot be underestimated. Nevertheless, economists themselves are aware that GDP or GNI alone cannot explain the various structural changes and

problems that constitute the main issues of development. To deal with contemporary problems faced by developed nations, as well as problems in the development efforts of underdeveloped nations, an interdisciplinary approach, combining many factors, has been started in research on country development.

International institutions, non-governmental organizations and scientists are looking for ways to measure development that would allow taking factors omitted in the above-mentioned economic indicators into account. These indicators are intended, *inter alia*, to cross-sectionally cover the socio-economic situation, measure selected issues as well as focus on social or ecological factors. What they have in common is their subject of interest – well-being. Selected alternative measures, mainly created by important international organizations, also have their limitations and are the subject of criticism, but draw attention to different topics, and thus complement commonly used economic indicators [Żołądek 2019].

RESEARCH MATERIAL AND METHODS

The main purpose of the article was to assess the eco-socio-economic development of world countries. For this purpose, the Comprehensive Eco-Socio-Economic Development Index (CESEDI) was proposed and used. It was calculated according to the formula:

$$\begin{aligned} \text{CESEDI} = & (NUNMS - CP_{GDP}) + (NUNMS - CP_{GNI}) + (NUNMS - CP_{HDI}) \\ & + (NUNMS - CP_{HCI}) + (NUNMS - CP_{HPI}) + (NUNMS - CP_{GDI}) \\ & + (NUNMS - CP_{EF}) + (NUNMS - CP_{HI}) + (NUNMS - CP_{SSIHw}) \\ & + (NUNMS - CP_{SSIEw}) + (NUNMS - CP_{SSIEcW}) \end{aligned}$$

where: *NUNMS* – the number of UN member states [UN 2020], *CP* – the position of a country in a given ranking.

The number of UN member states is 193, so the leader of a given ranking receives a maximum 192 points. Countries not included in the ranking receive 0 points. CESEDI is the sum of points obtained from 11 rankings.

The study uses up-to-date rankings based on indicators used to assess a country's socio-economic or environmental growth and development. Various types of reports and databases were used during the research.

RESEARCH RESULTS

A country's economic development is generally measured by one of the basic measures of labor performance of a country's society – Gross Domestic Product (GDP). This measure has become a universal measure of socio-economic development. However, GDP does not adequately account for social welfare as well as environmental costs. As development involves many aspects, it is important to use different indicators. This facilitates the

objective assessment of the socio-economic development of individual countries in the world. The study presents indicators used to assess socio-economic and environmental growth as well as the development of countries:

1. Gross Domestic Product (GDP) per capita,
2. Gross National Income (GNI) per capita,
3. The Human Development Index (HDI),
4. The Human Capital Index (HCI),
5. The Happy Planet Index (HPI),
6. The Gender Development Index (GDI),
7. Ecological Footprint (EF) per capita,
8. The Happiness Index (World Happiness Report),
9. The Sustainable Society Index (SSI):
 - Human Wellbeing (SSI HW),
 - Environmental Wellbeing (SSI EnW),
 - Economic Wellbeing (SSI EcW).

Gross Domestic Product (GDP) measures the monetary value of final goods and services – those that are bought by an end-user – produced in a country in a given period of time [IMF 2020]. The OECD defines GDP as “an aggregate measure of production equal to the sum of the gross value added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs)” [OECD 2002]. However, nominal GDP does not reflect differences in the costs of living and inflation rates between countries. When comparing living standards between nations, a better measure is GDP per capita at purchasing power parity (PPP).

A frequently used measure, apart from GDP, is Gross National Product (GNP), which is the total value of all final products and services produced in a given period with the use of means of production owned by the inhabitants of a given country [Investopedia 2020]. The basic difference between GDP and GNP is the fact that GNP includes the product generated by the labor and capital of the entire nation, i.e. also by citizens of a given country abroad. The Gross National Product in international statistics is gradually being replaced by Gross National Income (GNI). Despite a similar concept, it is calculated differently, according to the formula [The Balance 2020]:

$$\begin{aligned}
 &GNI \\
 &= GDP + (\text{income from citizens and businesses earned abroad} \\
 &\quad - \text{income remitted by foreigners living in the country back to their home countries})
 \end{aligned}$$

The Human Development Index (HDI) is a synthetic index of life expectancy, education and per capita income that is used to classify countries according to their level of socio-economic development. The HDI index assesses countries on three dimensions:

- a long and healthy life,
- knowledge,
- the standard of living.

The “Long and healthy life” dimension is assessed based on life expectancy. The “Knowledge” dimension is measured by the average number of years of education received by residents aged 25 and over and the expected number of years of education for children

entering education. The “Standard of living” dimension is measured by gross national income per capita. The results for the three HDI dimensions are then aggregated into a composite index using the geometric mean [UNDP 2020b]. The final HDI is between 0 and 1, with countries grouped into four categories depending on their value [UNDP 2019b]:

- countries with very high human development (HDI above 0.800),
- countries characterized by high human development (HDI from 0.700 to 0.799),
- countries with medium human development (HDI from 0.550 to 0.699),
- countries with low human development (HDI below 0.550).

The Human Capital Index (HCI) shows which countries make the best use of their citizens’ economic and professional potential. The index measures how much capital each country loses due to lack of education and adequate health care. HCI combines indicators of health and education into a measure of the human capital that a child born today can expect to obtain by his/her 18th birthday, given the risks of poor education and health that prevail in the country where the individual lives. The HCI is measured in units of productivity to the level of full education and full health and ranges from 0 to 1. By multiplying the HCI value by 100 percent, it is possible to indicate what performance a child born today will achieve as a future employee, as she would be if she enjoyed complete education and full health [Kraay 2018]. The HCI consists of five indicators:

- probability of survival to age 5,
- expected school years,
- harmonized test scores as a measure of the quality of learning,
- adult survival rate (percentage of 15-year-olds that survive until age 60),
- the rate of stunting for children under age 5.

The Happy Planet Index (HPI) is a measure of sustainable welfare. It compares how people in different countries use natural resources efficiently to achieve a long and good life. It is calculated according to the formula below [NEF 2016]:

$$\text{Happy Planet Index} = \frac{\text{life expectancy} \times \text{wellbeing} \times \text{inequality of outcomes}}{\text{Ecological Footprint}}$$

where:

- life expectancy – the average number of life years for an infant born in that country;
- wellbeing – the average of all responses from within the population to the following question: “Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top. Suppose we say that the top of the ladder represents the best possible life for you; and the bottom of the ladder represents the worst possible life for you. On which step of the ladder do you feel you personally stand at the present, assuming that the higher the step the better you feel about your life, and the lower the step the worse you feel about it? Which step comes closest to the way you feel?”;
- inequality of outcomes – a measure of how unevenly the distribution of life expectancy and assessed well-being outcomes is in a country;
- the Ecological Footprint – the average amount of land needed per capita to maintain a country’s typical consumption patterns.

The Gender Development Index (GDI) measures the gender gap in human development achievement, taking the differences between women and men in the three basic dimensions of human development - health, knowledge and living standards, using the same component indices as in the HDI into account. GDI is the ratio of HDI calculated separately for men and women using the same methodology as for HDI. It is a direct measure of the gender difference showing the HDI of women as a percentage of male HDI [UNDP 2020a]. The components of GDI are [UNDP 2019b]:

- health, measured by the life expectancy of men and women at birth,
- knowledge, measured by the expected number of years of education for children (women and men) and the average number of years of education for adult women and men aged 25 and over,
- standard of living, measured with the estimated GNI per capita of women and men.

The index is useful for understanding the actual gender difference in social development achievement and helps design social policy tools to eliminate these differences. The countries in the ranking are grouped into five groups based on the absolute deviation from gender parity in HDI values, ranging from 1 (closest to gender parity) to 5 (furthest from gender parity). Grouping takes an equal account of differences between the sexes, favoring both men and women.

The Ecological Footprint (EF) measures the ecological resources that a population needs to produce the natural resources they use (including plant-based food and fiber products, livestock and fish products, wood and other forest products as well as space for urban infrastructure) and to absorb waste, especially carbon dioxide emissions. The ecological footprint determines how much a biologically productive area is needed to meet all the demands of society. These requirements include space for food cultivation, fiber production, forest cultivation, the absorption of carbon dioxide emissions from fossil fuel combustion and the infrastructure built. The ecological footprint uses the yield of primary products (crops, forests, pastures and fisheries) to calculate the area needed to support an activity [GFN 2020a]. The footprint is measured in global hectares (gha) per person. This unit expresses the estimated number of hectares of land and sea needed to compensate for resources used for the consumption and absorption of waste. The concept of bio-capacity is closely related to the ecological footprint. Bio-capacity is measured by calculating the amount of biologically productive land and sea areas available to provide the resources that the population consumes and to absorb their waste, taking current management technologies and practices into account. EF is calculated according to the formula:

$$EF_C = EF_P + (EF_I - EF_E)$$

where: EF_C – the Ecological Footprint of Consumption – indicates the consumption of bio-capacity by the inhabitants of a country, EF_P – the Ecological Footprint of Production – indicates the consumption of bio-capacity resulting from production processes in a given geographical area, $(EF_I - EF_E)$ – the Net Trade Ecological Footprint – indicates the use of bio-capacity in international trade.

A country has an ecological reserve if its EF is less than its bio-capacity. Otherwise, it has an ecological deficit. Currently, most countries have environmental deficits. More than 85% of the world's population lives in countries with an ecological deficit.

The World Happiness Report is a global happiness survey that ranks 156 countries according to how happy their citizens are. The report presents the Happiness Index (HI) which allows us to measure the happiness of a given country. HI consists of six variables:

- real GDP per capita,
- social support,
- healthy life expectancy,
- freedom to make life choices,
- generosity,
- perceptions of corruption.

Each variable measures an average score on a scale of 0 to 10, weighted by population. This result is tracked over time and compared with other countries. Each country is also compared to an imaginary country called Dystopia. Dystopia represents the lowest national averages for each key variable [Helliwell et al. 2020].

The Sustainable Society Index (SSI) indicates the level of sustainable development of each of the assessed countries. It is used to monitor a country's progress towards sustainable development, set priorities for sustainable development, make comparisons between countries, educational purposes as well as further research and development [SSF 2017b]. SSI integrates three dimensions of well-being: social, environmental and economic. Each country is ranked for a given dimension. The SSI includes 21 indicators, grouped into 7 categories, belonging to individual dimensions [SSF 2017a]:

1. Human Wellbeing:
 - basic needs,
 - personal development and health,
 - a well-balanced society.
2. Environmental Wellbeing:
 - natural resources,
 - climate and energy.
3. Economic Wellbeing:
 - transition,
 - the economy.

To create the Comprehensive Eco-Socio-Economic Development Index (CESEDI), world country rankings were used. It is based on the previously presented indicators of socio-economic development. Table 1 presents world countries with the highest CESEDI and points from individual rankings. The country with the highest CESEDI was Norway, which scored 1,782 points in the survey (out of 2,112 possible). Norway ranked high in the rankings, focusing mainly on economic factors and social welfare (HDI, SSI EcW, GDP, DNB, etc.), while scoring few points in rankings on environmental issues (EF, SSI EnW). The other countries at the top of the ranking are characterized by a similar profile.

Besides the top twenty, there are countries such as Australia (22nd place), Italy (24th place), Canada (26th place), Belgium (31st place), Japan (33rd place) and the United

Table 1. The Comprehensive Eco-Socio-Economic Development Index

Ranking	Country	GDP	GNI	HDI	HCI	HPI	GDI	EF	HI	SSW HW	SSI EnW	SSI EcW	CESEDI
1	Norway	187	189	192	176	181	174	41	188	188	74	192	1,782
2	Switzerland	188	188	191	174	170	112	51	190	179	128	191	1,762
3	Denmark	181	181	183	177	162	146	26	191	184	96	186	1,713
4	Finland	173	175	182	189	157	173	31	192	192	71	174	1,709
5	Netherlands	182	182	184	185	175	118	49	187	190	61	166	1,679
6	Sweden	178	177	186	186	133	148	29	186	187	78	189	1,677
7	Germany	179	179	189	183	145	122	48	176	191	63	178	1,653
8	Austria	180	180	174	182	151	111	34	184	180	98	161	1,635
9	Slovenia	160	159	170	181	112	189	45	161	186	111	151	1,625
10	United Kingdom	170	170	178	179	160	119	57	180	181	100	129	1,623
11	Ireland	189	187	190	188	146	139	46	177	183	70	106	1,621
12	Slovakia	154	154	157	155	135	178	62	158	173	110	167	1,603
13	France	169	171	168	172	150	158	54	170	176	83	127	1,598
14	Czech Republic	163	160	167	180	130	150	38	174	182	64	188	1,596
15	Poland	152	152	161	165	132	177	56	152	177	89	179	1,592
16	Iceland	183	178	188	162	155	117	0	189	189	75	150	1,586
17	Uruguay	134	132	136	127	179	154	122	168	144	112	176	1,584
18	Romania	147	147	142	128	139	161	87	148	164	139	181	1,583
19	New Zealand	166	165	180	173	156	113	50	185	159	58	177	1,582
20	Spain	164	166	169	163	178	147	64	166	157	117	91	1,582

Source: own study based on [Jeffrey et al. 2016, SSF 2017c, WBG 2018, UNDP 2019a, GFN 2020b, Helliwell, et al. 2020, World Bank 2020a, 2020b]

States (36th place). The difference between Norway and the United States was close to 300 points. A special country is Iceland, which took 16th place in the ranking, despite its absence in one of the (EF) rankings, which are components of the CESEDI. Assuming Iceland achieved the average EF value for the remaining countries in the ranking (3.2 gha per capita), it would receive 1,702 points, which would allow it to take 5th place in the CESEDI ranking.

Uruguay is the only country from the TOP-20 with 100 points or more in all the components of the ranking (Thailand is the second country of this sort, coming 30th in the final ranking). Of the 20 countries with the highest CESEDI, 18 are in Europe, 1 in South America (Uruguay) and one in Oceania (New Zealand).

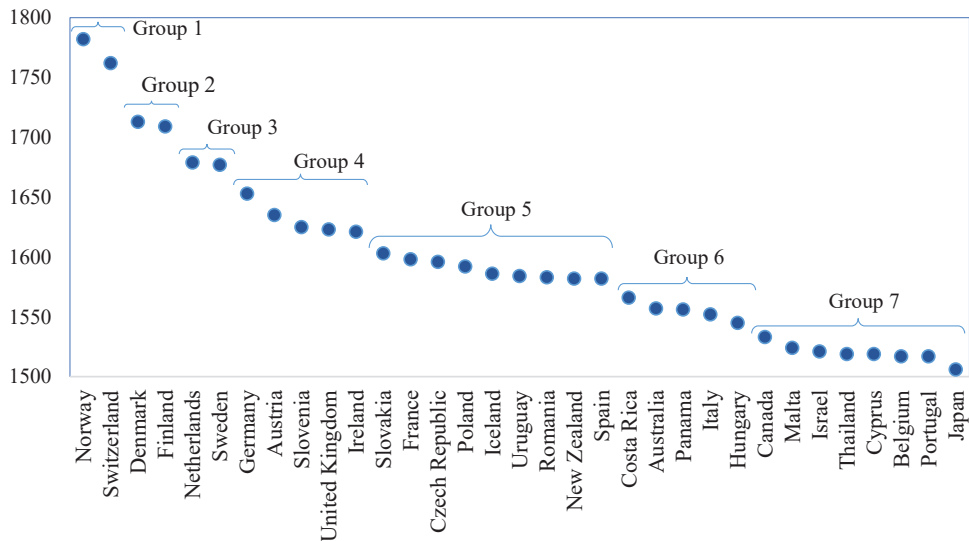


Figure 1. Country groups based on the CESEDI

Source: own study based on [Jeffrey et al. 2016, SSF 2017c, WBG 2018, UNDP 2019a, GFN 2020b, Helliwell, et al. 2020, World Bank 2020a, 2020b]

The leaders of the individual component rankings were: Luxembourg (GDP), Qatar (DNB), Norway (HDI, SSI EcW), Singapore (HCI), Costa Rica (HPI), Kuwait (GDI), East Timor (EF), Finland (HI, SSI HW) and Burundi (SSI EnW).

Figure 1 shows 33 countries with a CESEDI over 1,500 points. These countries were grouped according to the level of the indicator – 7 groups with a spread of 40 points were created. Four Scandinavian countries are in groups 1-3 (above 1,660 ranking points). Group 4 (1,621-1,660 points) includes two island countries (Ireland and the United Kingdom), two neighboring German-speaking countries (Germany and Austria) and Slovenia. Group 5 (1,581-1,620 points) consists mainly of Central and Eastern European countries, but also France, Spain, Iceland and two non-European countries. Countries from groups 6 and 7 (below 1,581 points) include two Central American countries, two European island countries, four continental European countries, three Asian countries, as well as Canada and Australia.

CONCLUSIONS

1. Many indicators focus on different aspects of country development. These include Gross Domestic Product, Gross National Income, the Social Development Index, the Human Capital Index, the Happy Planet Index, the Gender Development Index, the Ecological Footprint, the Happiness Index, and the Sustainable Society Index. Because these

indicators present development in various terms (cultural, social, ecological, political, and economic), the need arose to create a comprehensive approach to measuring the level of development of countries around the world. The Comprehensive Eco-Socio-Economic Development Index (CESEDI) was therefore proposed.

2. The countries with the highest CESEDI mainly include European countries (31 countries from the TOP-50 ranking are located in Europe). The countries with the highest CESEDI were Scandinavian countries (Norway, Denmark, Finland and Sweden), Germany and their neighbors (Switzerland, the Netherlands and Austria). Surprisingly high positions were taken by countries of Eastern and Southeastern Europe (Slovenia, Slovakia, the Czech Republic, Poland and Romania), which were in the top 20 countries, ahead of such countries as Canada, the United Kingdom, Japan and the United States.
3. The best results in the ranking were achieved by European countries. The average number of points for 43 European countries is 1,382 and is the highest among all regions, even though two countries (Monaco and San Marino) were not classified in any of the sub-rankings, and their CESEDI was 0. In terms of 41 European countries, the average is almost 1,449 points. The next regions with the highest averages were South America (12 countries) – 1,219 points and Asia (47 countries) – 1,088 points. The average for 23 countries of North America was 984 points, Africa (54 countries) – 790 points, and Australia and Oceania (14 countries) – 502 points. These results show that European and South American countries are, on average, more developed in terms of ecological, social and economic development than countries in the rest of the world.
4. Out of 193 countries in the ranking, Norway achieved the highest number of points, with 1,782 points (84.4% possible). The highest-ranked South American country was Uruguay (17th place), Asia – Israel (28th place), North America – Costa Rica (21st place), Africa – Mauritius (49th place), and Australia and Oceania – New Zealand (19th place). The average for all countries classified in the ranking was 1,023 points. 98 countries achieved this or higher results. The country with the lowest CESEDI was Micronesia (155 points), slightly ahead of Andorra (156 points).
5. By comprehensively assessing countries in terms of various factors (economic, ecological, social and cultural) that affect the development level of a given country and the well-being of its inhabitants, it was observed that the position of countries is often completely different than in rankings only taking economic issues (e.g. GDP) into account. The needs and limitations of the land in the 21st century force a paradigm shift that shapes the concept of prosperity. A one-way approach to assessing the level of a country's development based on its economic growth rate is unacceptable. The limited resources of the earth and its bio-resistance to human activity forces a reevaluation of the importance of individual factors that determine the standard of living of people. The proposed index attempts to include most of the elements necessary for the safe, healthy and happy life of citizens of the surveyed countries, assuming that all components of the Comprehensive Eco-Socio-Economic Development Index are equally important.

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EKOLOGICZNO-SPOŁECZNO-GOSPODARCZY POZIOM ROZWOJU KRAJÓW ŚWIATA – PROPOZYCJA KOMPLEKSOWEJ OCENY

Słowa kluczowe: środowisko, ekologia, ekonomia, rozwój, gospodarka, wskaźniki

ABSTRAKT

Celem głównym artykułu jest ocena rozwoju ekologiczno-społeczno-ekonomicznego krajów świata. Do tego celu zaproponowano i wykorzystano Kompleksowy Wskaźnik Rozwoju Ekologiczno-Społeczno-Gospodarczego (KWRESG). Zaproponowany miernik bazuje na kilkunastu uznanych i stosowanych w literaturze wskaźnikach do oceny państw w zakresie ich społecznych, ekonomicznych i środowiskowych osiągnięć. Podjęto próbę ujęcia większości elementów niezbędnych do bezpiecznego, zdrowego i szczęśliwego życia obywateli badanych krajów. Zaprezentowano światowych liderów, określonych na podstawie wysokości KWRESG. Ponadto przedstawiono poszczególne składowe KWRESG i ich poziom w badanych krajach. Stwierdzono, m.in. że 18 spośród 20 krajów o najwyższym KWRESG to kraje europejskie. Liderami rankingu były wysokorozwinięte kraje skandynawskie (Norwegia, Dania, Finlandia) oraz Szwajcaria. Wysokie pozycje w rankingu zajęły kraje Europy Wschodniej oraz Południowo-Wschodniej (Słowenia, Słowacja, Czechy, Polska i Rumunia), które wyprzedziły takie kraje, jak Kanada, Wielka Brytania, Japonia i Stany Zjednoczone. Wyniki przeprowadzonych badań wskazują, że kraje europejskie i południowoamerykańskie są średnio bardziej rozwinięte pod względem ekologiczno-społeczno-ekonomicznym niż kraje z pozostałych regionów świata.

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